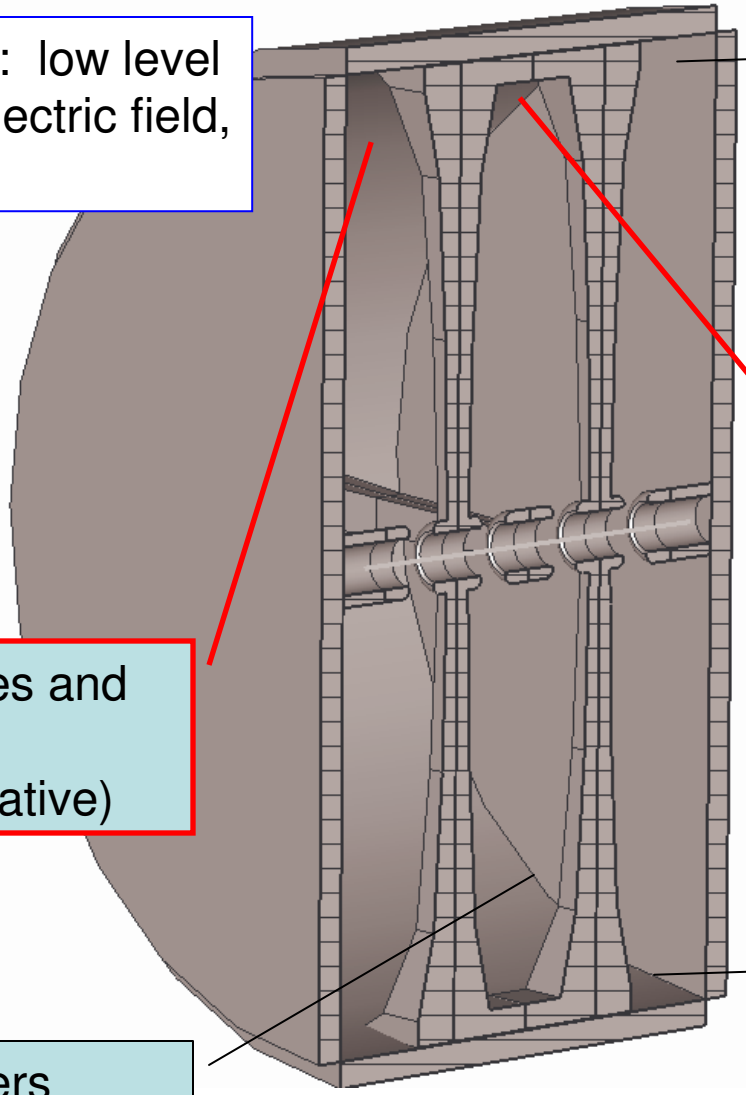
Multipacting in CH1 (?)

MP? Suspicious places

Suspicious place: low level almost uniform electric field, big flat surface



With tuners (not shown)

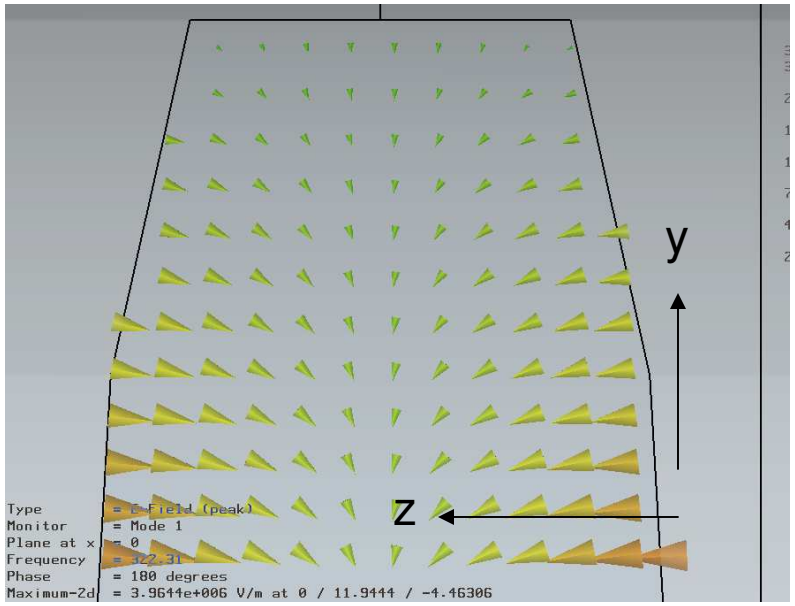
Between spokes (checked, positive)

Between spokes and end-wall (checked, negative)

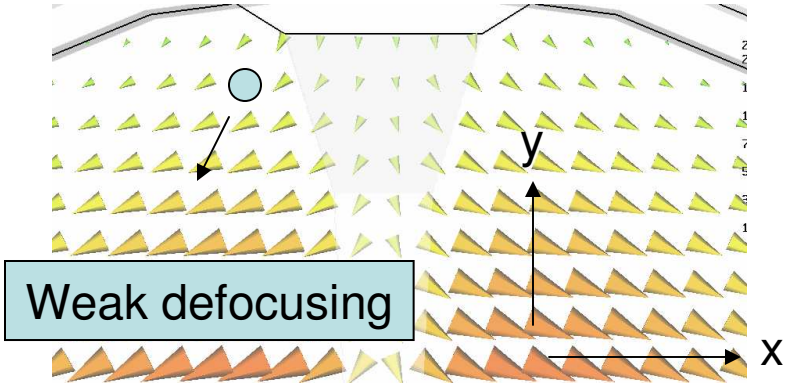
Without tuners

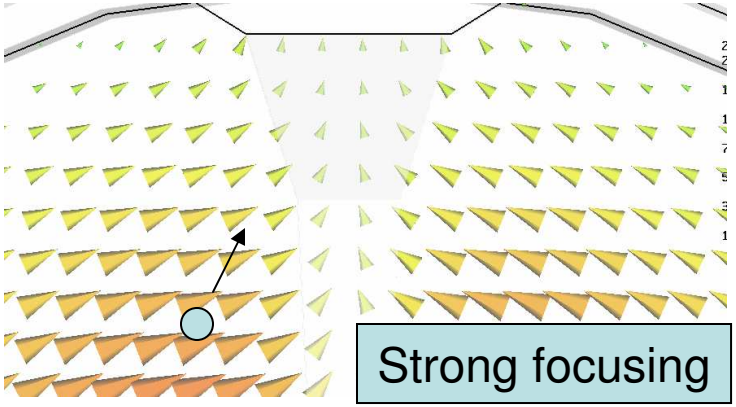
In the corners

Field distribution between spokes.

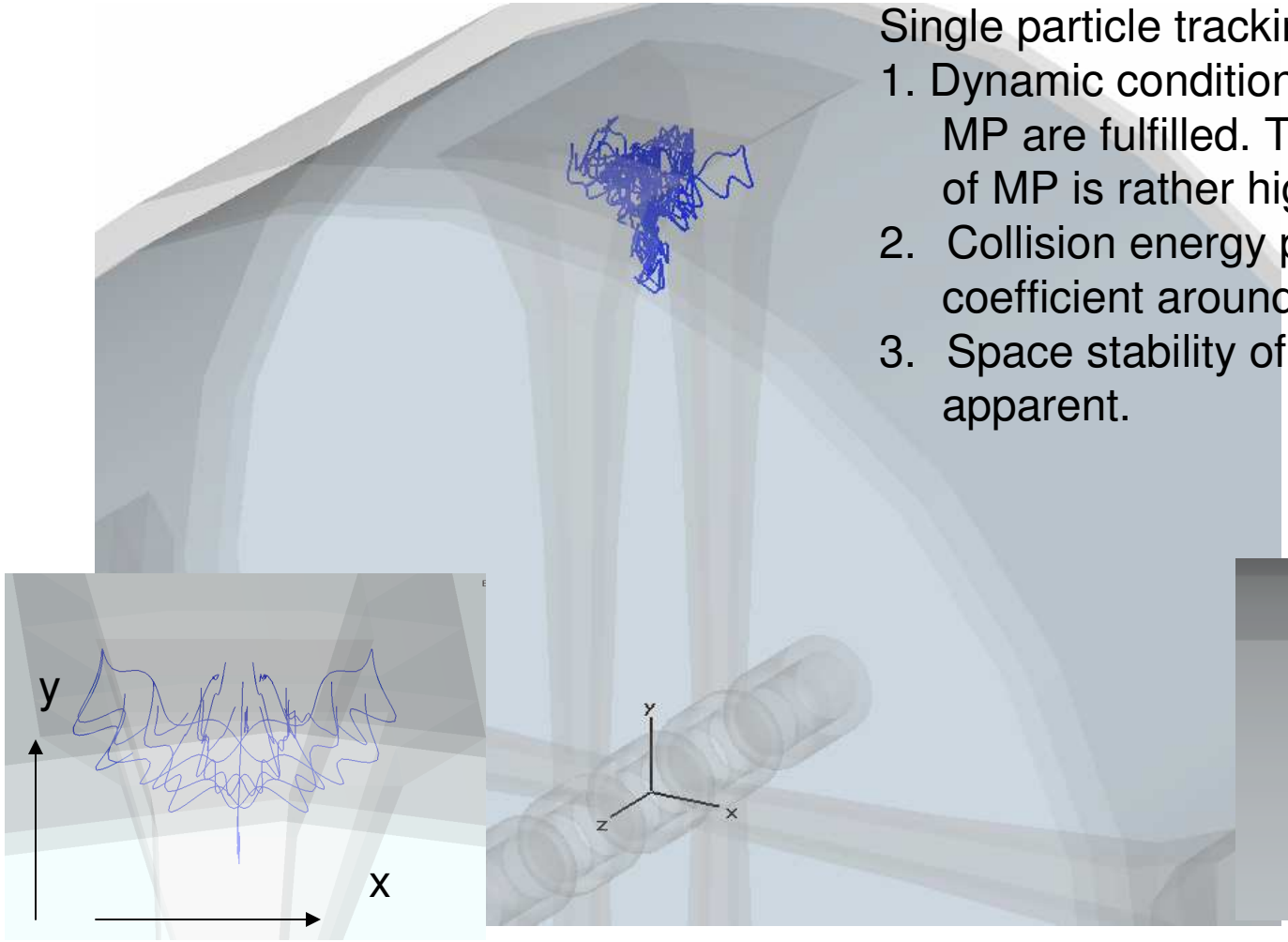


Field distribution between spokes provides field gradient along Y, which is necessary for one-point MP, and focusing in X-Y plane.





Particle tracking in RT CH1 at P ≈ 1 kW



Single particle tracking shows:

1. Dynamic conditions for one-point MP are fulfilled. Though the order of MP is rather high - 4-5.
2. Collision energy provides re-emission coefficient around maximum for Cu.
3. Space stability of particles motion is apparent.

Multipacting in PETRA II cavity. Steady state.

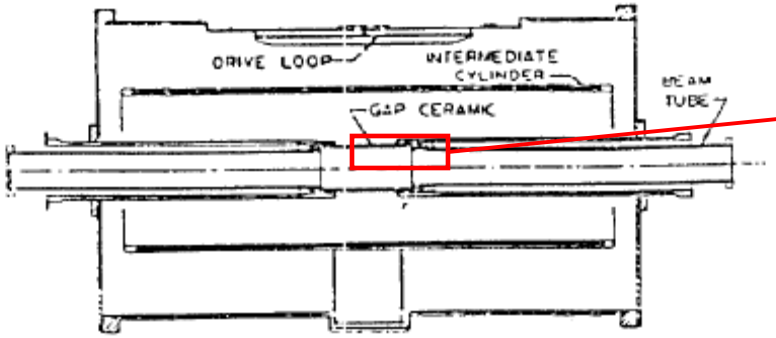


Figure 1. Schematic view of the 52 MHz cavity. This Fig. is taken from[1].

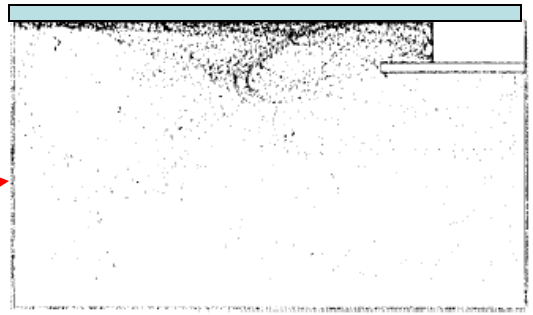
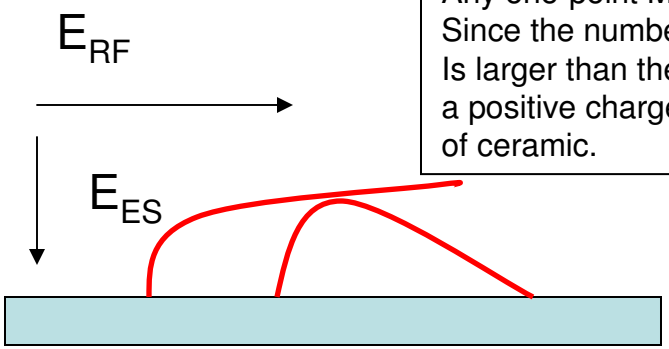
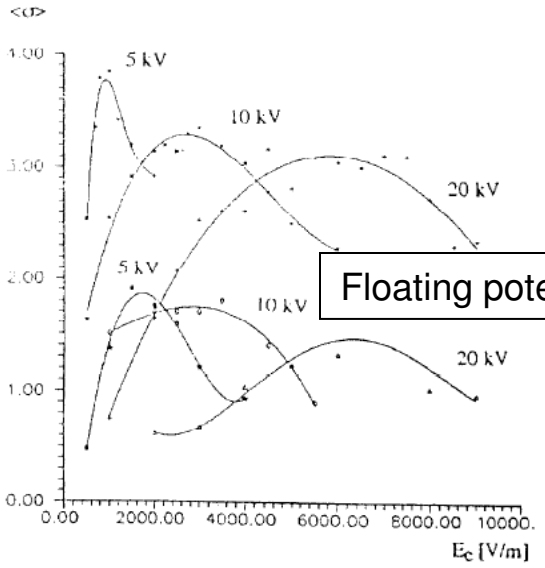


Figure 4. Simulation of one-electrode non-resonant multipactoring at the accelerating voltage of 5 kV and the electrostatic field 1.9 kV/m.

Any one-point MP requires returning force.
Since the number of emitted electrons
Is larger than the number of incident ones,
a positive charge is generated on the
of ceramic.





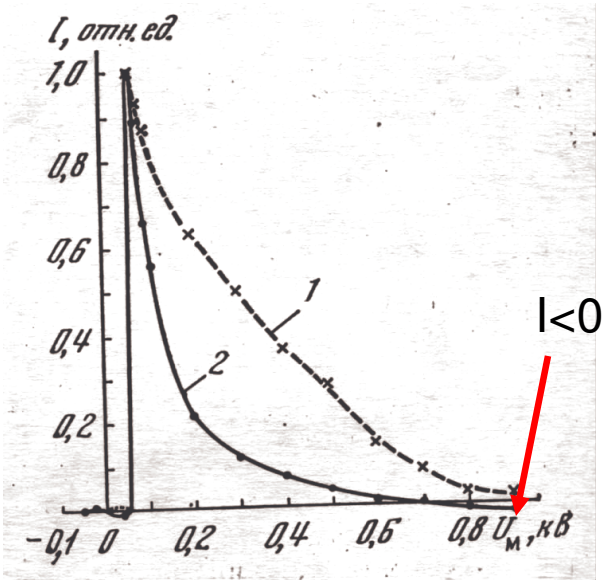
Floating potential

Figure 3. Integral re-emission coefficient <σ> as a function of

Electrons can leave dielectric at any phase.
Broadband phase of collision -> integral secondary re-emission coefficient: $<\sigma>= f(E_{RF}, E_{ES,}\sigma)$

Development of MP at dielectric for E_{RF}||

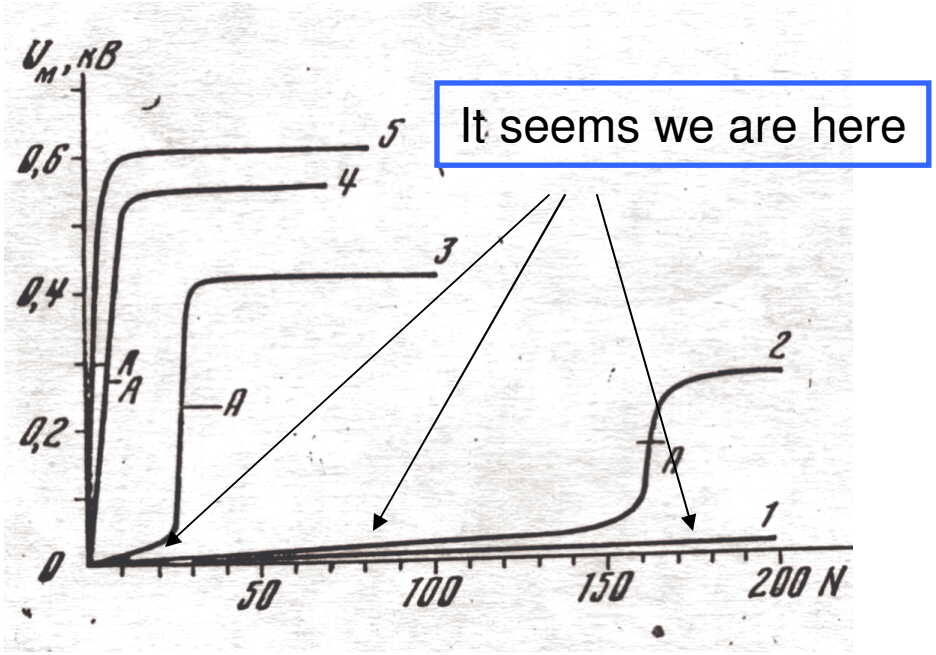
Assume that E provides mean energy for background electrons optimal for re-emission.



Current from dielectric target (2) vs floating potential. No MP, only background *ee*

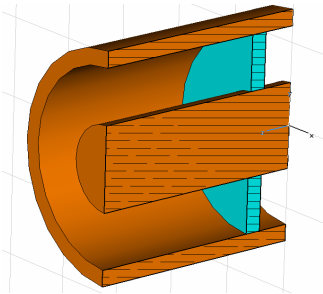
I_b – current of incident background *ee*

$I_e = \sigma * I_b$ – emitted current



It seems we are here

Floating potential as a function of time for different power.



[6] L.V.Grishin et al. Investigation of Secondary- Emission RF-Discharge at Big Angles of Electron Flight. Proceedings of Lebedev Physical Institute, Vol. 92, pp.82-131, 1977 (in Russian).

CONCLUSION

1. The ceramic window is charged by background electrons.
2. We don't reach full MP, presumably because of low re-emission coefficient of the ceramic (Sigma>3.5-3.7 at least is needed).
3. TiN coating of vacuum side of ceramic would be a good pre-emptive measure.
4. The processes in the cavities require further study. But probably TiN coating of inter-spoke area should be considered.
5. A look at the similar area in TSR would not be out of place.
6. It's time to upgrade PC devoted for MWS.